

BELLCOMM, INC.

SUBJECT: Trip Report - Joint Tank Review
at Bell Aerosystems, February 8-9,
1066 - Case 330

DATE: February 23, 1966

FROM: G. R. Huson

MEMORANDUM FOR FILE

Tanks for the NAA CM and SM RCS, Douglas S-IVB APS, Grumman LEM RCS and Boeing Lunar Orbiter are all being fabricated by Bell Aerosystems. Major problems in the past have been that the teflon bladders have shown durability inadequacies and the titanium tank shells have experienced stress corrosion failures with N_2O_4 . The first day of the meeting was largely devoted to program status and propellant tank subsystem performance while the second day was devoted to a discussion of stress corrosion elimination.

The first day's presentation was not as informative as in the past. Significant results are, (1) Durability appears to be closer to demonstration; (2) most failure mechanisms now known are understood; and (3) the friction between the bladder and the cylindrical shell causes high bladder strain after refilling. The LEM bladders have already been reduced in diameter to eliminate this situation. The SMO bladders are also subject to this failure mode and Bell has recommended either diameter reduction or friction coefficient reduction by coating.

Permeation of the bladders by pressurizing gas and propellant vapors is not being measured at Bell as originally planned. Permeation rates should be known to aid in understanding the thruster operation. Further inquiry into this area is being made.

Boeing has evaluated bladders with an aluminum foil laminate to reduce permeation and has required this change on the LO tanks.

Stress Corrosion by N_2O_4

Stress corrosion seems to be eliminated by the presence of NO (which colors solid N_2O_4 green). The oxidizer is now being procured to a temporary specification which requires between .45-.8% NO.



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Langley Research Center has caused compressive stresses in titanium surfaces by glass-bead peening. When a tensile stress is applied the surface becomes unstressed and, therefore, resistant to stress corrosion. So far only Langley has a setup for glass-bead peening and the contractors are sending tanks to them for processing.

A committee has been appointed (by Dr. J. Shea, MSC) to determine how the confidence in the solution to stress corrosion can be increased to levels required for the Apollo program. The Joint Tank Review group was divided in its opinion. The most frequent opinion seemed to be that increasing the minimum NO concentration was a cure. However, more tests and/or an understanding of the mechanism were required. Tanks are being bead peened to increase the safety margin.


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2031-GRH-sam

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